Hall Ticket Number :										

R-14

Code: 4GC42

II B.Tech. II Semester Supplementary Examinations March 2021

Probability and Statistics

(Common to CE, ME & IT)

Max. Marks: 70 Time: 3 Hours

Answer *all five* units by choosing one question from each unit (5 x 14 = 70 Marks)

****

Marks

UNIT–I

1. a) In a bolt factory machine A, B, C manufacture 20%, 30% and 50% of the total of their output and 6%, 3%, and 2% are defective. A bolt is drawn at random and found to be defective. Find the probability that it is manufactured from (i) Machine A (ii) Machine B (iii) Machine C 7M

   b) A random variable X has the following probability distribution :

x	0	1	2	3	4	5	6	7
P(x)	0	K	2K	2K	3K	K^2	$2K^2$	$7K^2+K$

   Determine (i) K (ii) P(x<6) (iii) E[x^2] 7M

OR

2. a) The probability density *f(x)* of a continuous random variable is given by

   $f(x) = c\, e^{-|x|}$, $-\infty < x < \infty$

   Find the value of *c*, mean and variance of the distribution. 7M

   b) Bag I contains 4 white and 6 black balls while another Bag II contains 4 white and 3 black balls. One ball is drawn at random from one of the bags and it is found to be black. Find the probability that it was drawn from Bag I. 7M

UNIT–II

3. a) The probability that the bulb of 100 days life is 0.05. Find the probability that one of 6 bulbs (i) At least one (ii) greater than four (iii) none, will be having a life of 100 days. 7M

   b) If a random variable has a Poisson distribution such that P(1)=P(2), find (i) mean of the distribution (ii) P(4) (iii) P(x $\geq$1) (iv) P(1<x<4) 7M

OR

4. a) The mean weight of 500 college students is 70 kg and the standard deviation is 3 kg. Assuming that the weight is normally distributed, determine how many students weigh: (i) between 70 kg and 75 kg. (ii) more than 80 kg. (iii) less than 64 kg. 7M

   b) The following data was collected over a period of 10 years, showing the number of injuries from horse kicks in each of the 200 army corps. The distribution of injuries was as follows:

No. of injuries	0	1	2	3	4	Total
Frequency	109	65	22	3	1	200

   Fit a Poisson distribution to the data and calculate the theoretical frequencies: 7M

UNIT–III

5. a) Traveling between two campuses of a university in a city via shuttle bus takes, on average, 28 minutes with a standard deviation of 5 minutes. In a given week, a bus transported passengers 40 times. What is the probability that the average transport time, i.e., the average for 40 trips, was more than 30 minutes? Assume the mean time is measured to the nearest minute. 7M

   b) The contents of seven similar containers of sulfuric acid are 9.8, 10.2, 10.4, 9.8, 10.0, 10.2, and 9.6 liters. Find a 95% confidence interval for the mean contents of all such containers, assuming an approximately normal distribution. 7M

OR

6. a) A population consists of the four numbers 3, 7, 11, 15. Consider all possible samples of size 2 which can be drawn with replacement from this population. Find the population mean and standard deviation, and mean and standard deviation of the sampling distribution of means. 7M

   b) Find 95% confidence limits for the mean of a normality distributed population from which the following sample was taken 15,17,10,18,16,9,7,11,13,14. 7M

UNIT–IV

7. a) Before an increase in excise duty on tea, 800 people out of a sample of 1000 were consumers of tea. After the increase in duty, 800 people were consumers of tea in a sample of 1200 persons. Find whether there is significant decrease in the consumption of tea after increase in duty? 7M

   b) Explain the following

   1) Null hypothesis 2) Critical region 3) Type I and Type II errors. 7M

OR

8. a) In a city A 20% of a random sample of 900 school boys had a certain slight physical defect. In another city B, 18.5% of a random sample of 1600 school boys had the same defect. Is the difference between the proportions significant at 0.05 level of significance? 7M

   b) The following are the samples of skills. Test the significant difference between the means at 0.05 level

Sample I	71.4	77.7	74.4	74	73.8	-
Sample II	70.8	74.9	74.2	70.4	69.2	72.2

7M

UNIT–V

9. a) The theory predicts the proportion of beans, in the four groups: A, B, C and D should be 9:3:3:1. In an experiment with 1600 beans the number in the four groups were 882, 313, 287 and 113. Does the experiment result support the theory. 7M

   b) Two random samples drawn from two normal populations have the variable values as below:

Sample1	28	30	32	33	31	29	34
Sample2	29	30	30	24	27	28	

   Examine whether the samples have been drawn from a normal population having the same variance. 7M

OR

10. a) A sample of size 13 gave an estimated population variance of 3.0 while another sample of size 15 gave an estimate of 2.5. Could both samples be from population with same variance? 7M

    b) In a pre-poll survey out of 1000 urban voters 540 favoured B and the rest A. Out of 1000 rural voters, 620 favoured A and the rest B. Examine if the nature of the area is related to voting performance using the Chi-square test. 7M

*****